Berth 156
Catalina Freight Bulkhead Wall Project
Sediment Characterization Results
Port of Los Angeles
San Pedro, California

Prepared for:

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ADP No. 060829-183

Project Number 4151001025-0001

amec

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LIST OF ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Earth & Environmental, Inc.
ARSSS	Anchorage Road Soil Storage Site
°C	degree Celsius
Calscience	Calscience Environmental Laboratories
CRG	CRG Marine Laboratories
CSTF	Los Angeles Contaminated Sediments Task Force
CTR	California Toxics Rule
cy	cubic yards
DGPS	differential global positioning system
EPA	U.S. Environmental Protection Agency
ERM	effects range-median
ERL	effects range-low
ft	foot/feet
in	inch/inches
ITM	Inland Testing Manual
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MLLW	mean lower low water
NBS	National Bureau of Standards
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
Port	Port of Los Angeles
QA/QC	Quality Assurance/Quality Control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
TEG	TEG Oceanographic Services, Inc.
TOC	total organic carbon
TRPH	total recoverable petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

The Port of Los Angeles (Port) is proposing to redevelop Berth 156 (Figure 1) as a mooring facility for Catalina Freight barges. The site currently consists of a rip rap-armored shoreline with paved upland area to the west. The proposed project includes construction of a new bulkhead wall and mooring dolphins. Construction of these structures will follow excavation of areas that are currently upland (above the +4.8 feet [ft] mean lower low water [MLLW] elevation), and new dredging of the existing harbor bottom (materials below the +4.8 ft MLLW elevation). The proposed disposal location for both excavated soils and dredged sediments is the Anchorage Road Soil Storage Site (Figure 1). The dredge footprint also contains the base portions of historical wharf timber piles. The Port plans to cut off the piles at the proposed project depth during the dredging phase and disposed of them separately at a permitted municipal solid waste disposal facility.

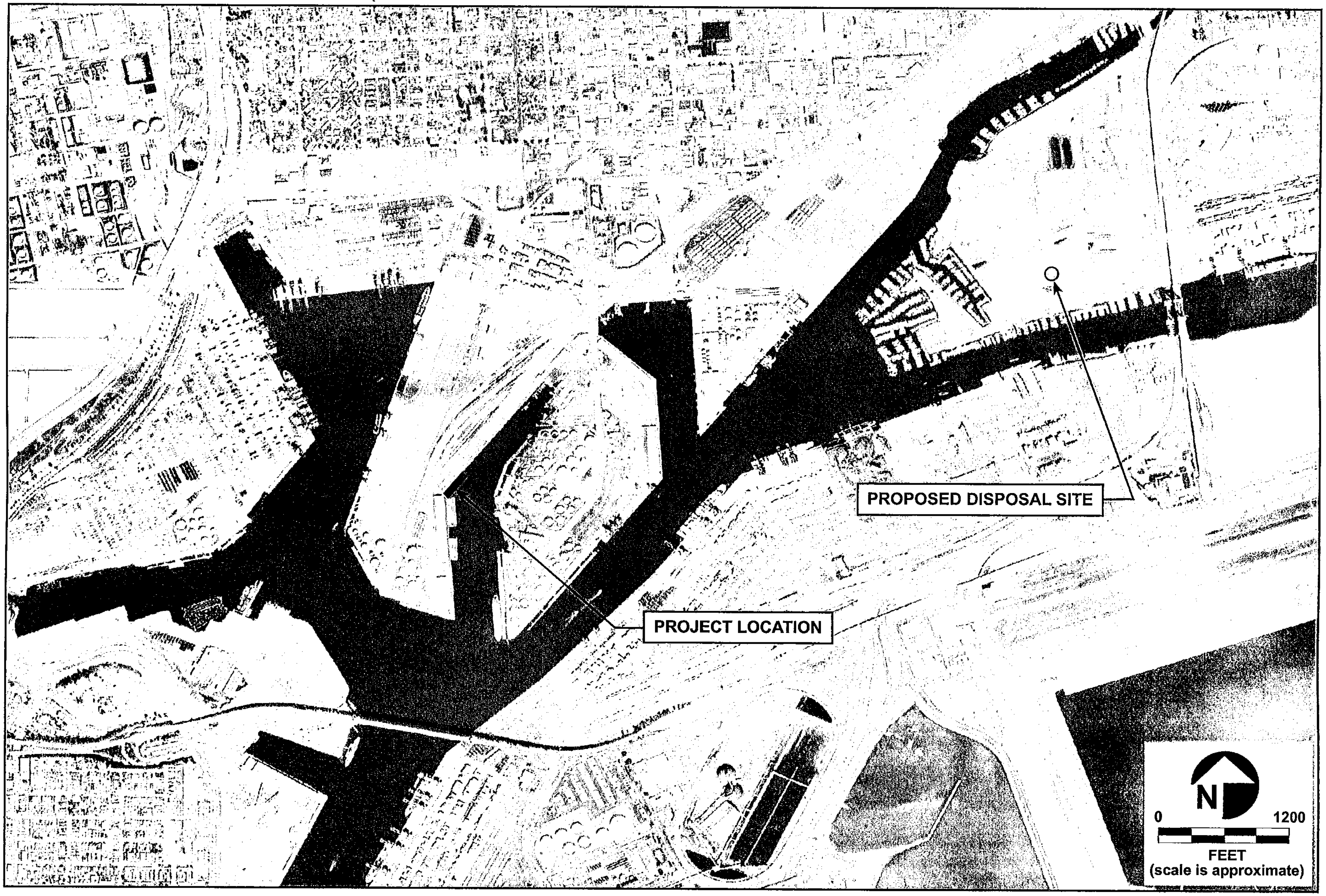
AMEC Earth & Environmental, Inc. (AMEC) has been contracted by the Port to conduct a sediment characterization of the project area. TetraTech, Inc. (TetraTech) has also been contracted by the Port and conducted sampling of the upland excavation areas. This report documents the results of the studies undertaken as proposed in the site-specific Sampling and Analysis Plan (SAP) (AMEC 2007). Tests were conducted according to the U.S. Environmental Protection Agency (EPA)/USACE guidance referred to as the Inland Testing Manual (ITM) (EPA/USACE 1998). Data included in this report are intended to support the issuance of (1) a dredging permit by the USACE under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean water Act of 1972 (as amended), and (2) a report of waste discharge by the Los Angeles Regional Water Quality Control Board.

It should be noted that this project is proposed at Berth 156 in the Port. The SAP refers incorrectly to Berth 155. Sampling locations and sample identification codes were intentionally coded to include reference to the Berth 155 project location at the time of SAP preparation. While all references to "155" in this report should be considered valid descriptors for nomenclature purposes, they are not indicative of the proposed project location.

2.0 MATERIALS AND METHODS

The SAP documented an approach which employed a vibracore to sample subtidal sediments from within the dredge footprint. However, while in the field, it was determined that hard bottom substrate was present from the shoreline out to a depth approximating the U.S. Pierhead line. As a result samples were collected outside the dredge footprint, but as close as possible to the pierhead line. Additional samples were collected from onshore using the upland soil sampling technique, as stated in the SAP. Therefore, rather than one set of sediment data, this report includes data from analysis of sediments offshore the dredging area and those collected from within the dredge prism under the shoreline armoring (Figures 2 and 3).

Offshore sediment collection occurred on 8 February 2007; TEG Ocean Services (TEG) provided the electrical vibracore equipment and personnel, Seaventures provided vessel and logistical support, and AMEC provided on-site supervision and personnel to handle and process sediment samples.



FIGURE

1

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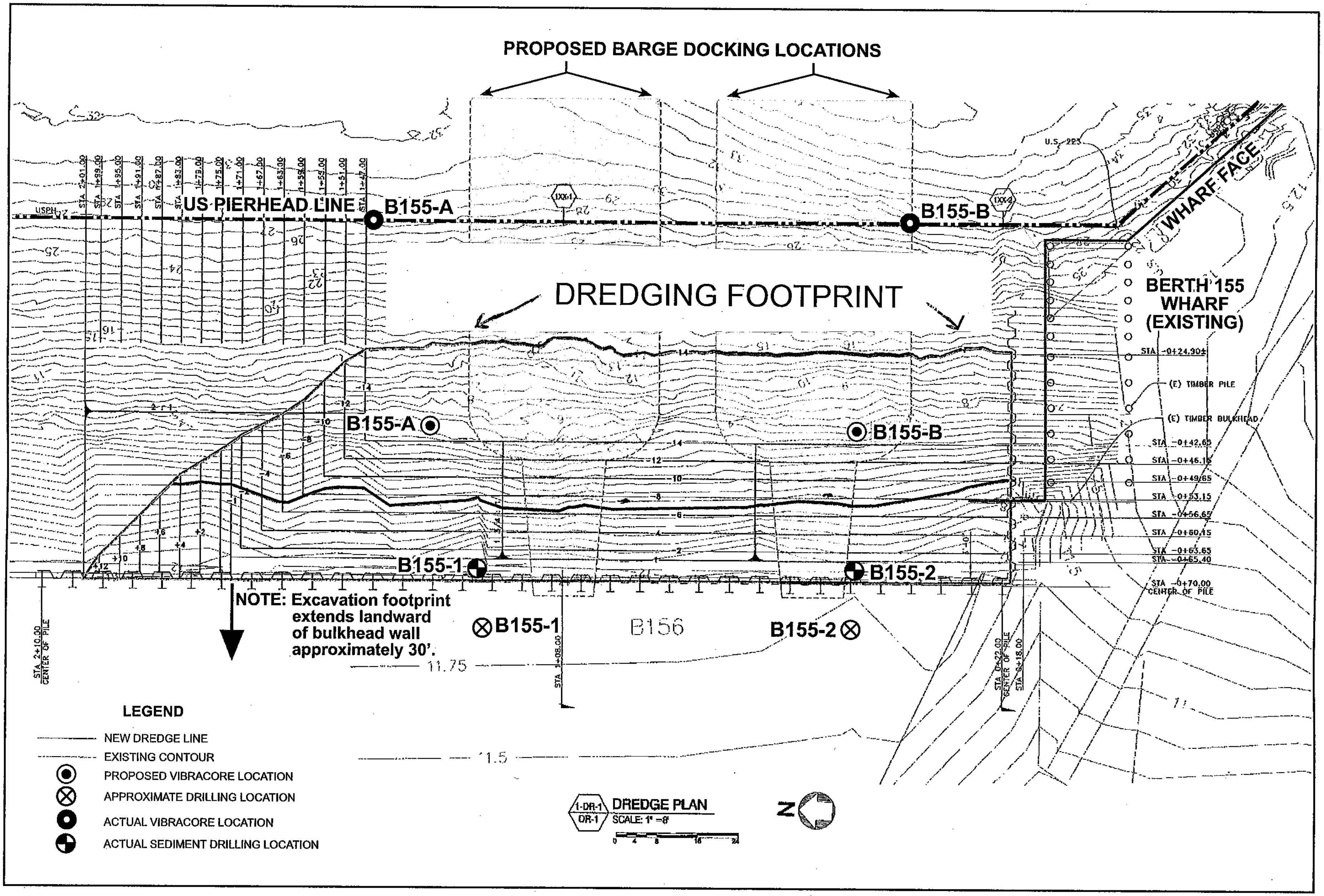
Project Location and Proposed Disposal Location
Berth 156 Bulkhead Wall Project
Port of Los Angeles, California

Graphics/Aquatics/POLA Berth155/LocationMap.fh8



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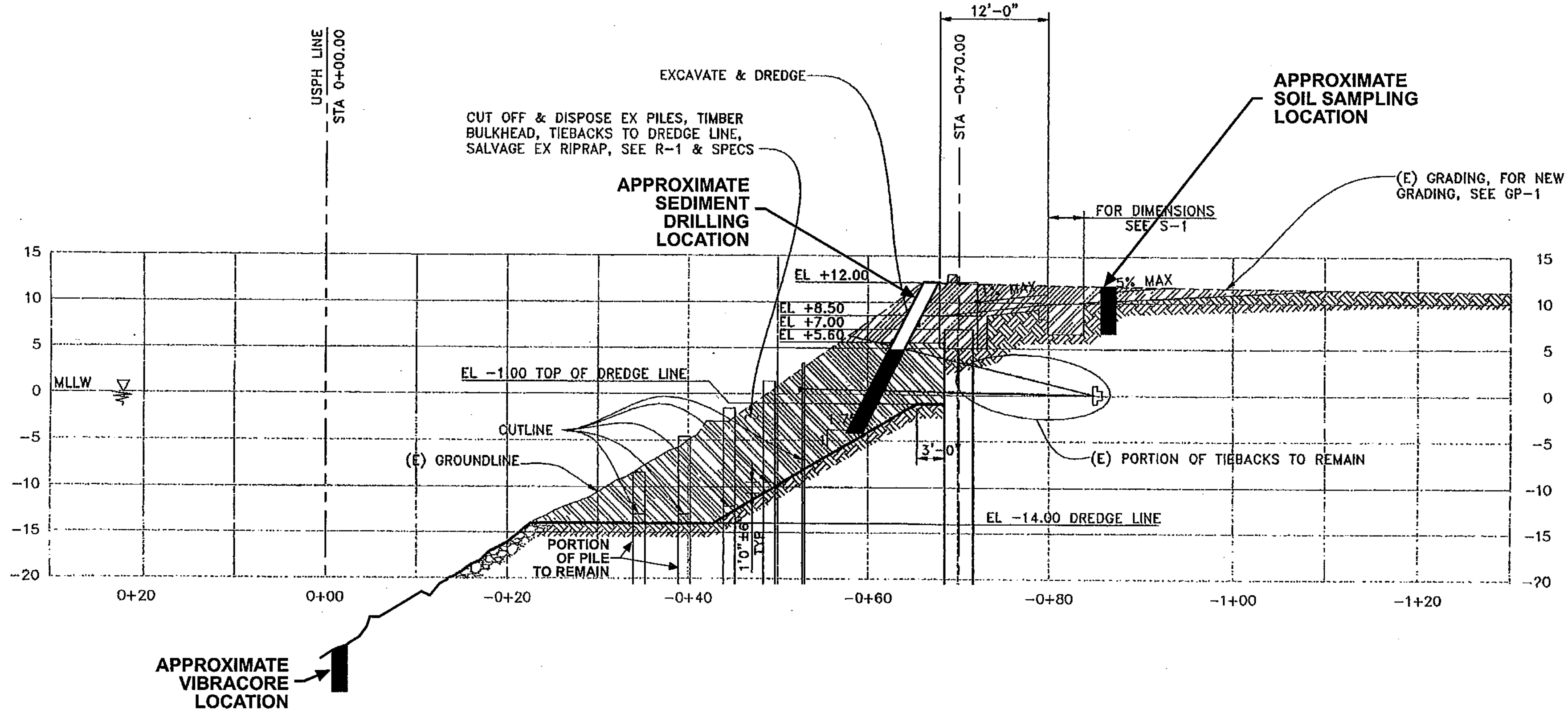
Proposed Dredging Footprint and Actual Sediment and Soil Sampling Locations
Berth 156 Bulkhead Wall Project
Port of Los Angeles, California

FIGURE 2

Graphics/Aquatics/POLA Berth155/DredgeExcavationR2.fh8



FIGURE

3

Cross Section View of Proposed Dredging and Excavation Areas with Actual Sampling Locations
Berth 156 Bulkhead Wall Project
Port of Los Angeles, California

Graphics/Aquatics/POLA Berth155/XSecExcavationR2c.fh8

Tetra Tech provided equipment and personnel for upland soil and land-side sediment push-coring activities on 1 March 2007. AMEC coordinated with Tetra Tech for the sediment sampling portion of the effort. All sample collection, handling, and preservation activities followed the procedures outlined in the ITM and the project-specific SAP (AMEC 2007); and are further detailed in the following sections.

2.1 Station Positioning

2.1.1 Marine Sediment Station Positioning

Once field activities commenced, the sampling stations were located from the vessel *Early Bird II* using a differential global positioning system (DGPS) with an accuracy of 3 meters. Upon deployment of the vibracore, and as stated above, it was determined that rip-rap armoring extended further down the slope than was originally anticipated. After adjusting the vessel position and surveying the area using a support vessel and weighted line, it was determined that the rip rap armoring extended out to approximately the U.S. Pierhead Line (at a depth of approximately -30 ft MLLW) (Figures 2 and 3).

Due to the presence of rip-rap, Stations B155A and B155B locations were sampled offshore and to the east of their original locations (Figure 2), outside the proposed dredging footprint. The sediment conditions may differ substantially from those below the riprap at the proposed sampling locations (i.e., within the dredge footprint).

The water depth, assessed using both vessel sonar and a weighted line, was compared with available bathymetric and tidal elevation data to verify the location. The vessel was secured over the sampling location using one bow and two stern lines.

2.1.2 Upland Soil and Sediment Station Positioning

Upland sampling locations were located based on information generated as part of the project planning process. Due to the need to establish push core entry points to the east of the existing bulkhead wall (i.e., shoreline side), sampling locations for the upland-accessed sediment sampling effort were located at the upper limit of the riprap armoring (Figure 3).

2.2 Sediment Collection

2.2.1 Marine Sediment Collection

AMEC's sediment collection at Stations B155A and B155B was conducted using TEG's vibracore. The vibracore uses a 4-inch-diameter aluminum tube (alloy 66030) connected to a stainless steel nosepiece. The vibrating unit is encased in aluminum and uses electricity to drive two 240-volt outer-rotating vibrators. The vibracore assembly was lowered by hydraulic winch until the nosepiece was at the harbor bottom. Following deployment, the unit was turned on, lowered and vibrated until project depth was reached, turned off and the tube extracted from the sediment. Once the vibracore was back on deck, the sediment was extruded onto a tray lined with a polyethylene plastic sleeve and visually examined for strata and other notable characteristics.

2.3 Upland-Accessed Sediment Collection

The upland soil sampling was performed by Tetra Tech using Core Probe International, Inc.'s Geoprobe push corer. Sediments were sampled by drilling down at a 27 degree angle, discarding materials above the +4.8 ft MLLW elevation and retaining materials between +4.8 ft MLLW and approximately -5 ft MLLW (Figure 3).

2.4 Sample Processing and Handling

Decontamination and sample processing procedures for sediment and soil samples followed the procedures outlined in the ITM and the project-specific SAP (AMEC 2007).

For the marine sediment sampling, the cores were logged, photographed, and sub-sampled. Individual cores were composited on board in a stainless steel stockpot using a stainless steel impeller. Core composite sub-samples were collected in glass containers with Teflon-lined lids and the remainder placed in clean, food-grade polyethylene bags. At the end of the day, an area composite sample was prepared in the field, subsampled, and handled in the same manner as the individual core samples. The composite sample was stored in a polyethylene plastic-lined bucket. Chemistry sample jars were promptly placed in coolers and covered with ice; samples were delivered to the Calscience Environmental Laboratories (Calscience) in Garden Grove, California at the end of the day. A sub-sample was also retained for grain size analysis and delivered to Nautilus Environmental laboratory (Nautilus) in San Diego, California. For all samples, archive material was collected and handled in the same manner as the test material. Since organic sheens were observed in samples, the decontamination procedure was performed with vigor between and following collection operations.

Two upland-accessed sampling locations were used to collect sediments from along the shoreline. Samples were retained in plastic sleeves which were sealed at each end, labeled, stored in iced coolers and submitted to the laboratory for analysis. Compositing of the two field-collected samples into one sample for analysis took place at Calscience's laboratory as noted on the chain of custody (COC).

2.5 Elutriate Site Water Collection

Site water for the elutriate samples was collected by AMEC on 8 Februray 2007. The *Early Bird II* is equipped with a high-pressure water pump that draws water from approximately 1.5 ft below the waterline; the pump system was flushed for approximately 2 minutes at the site prior to filling elutriate site water sample containers. Elutriate water was collected at B155A following the collection and processing of AMEC's last core sample. The water volume needed to prepare one elutriate sample, as well as a site-water sample (two 5-gallon buckets), was collected in double polyethylene bags contained within 5-gallon polyethylene buckets. Water was clear and free of any unusual odors. Sediment samples were transferred to Calscience on 8 February 2007 by AMEC staff. Elutriate and site water samples were transferred to Calscience on 15 October 2007 by AMEC staff.

2.6 Sample Preparation and Analysis

Chemical analyses listed in Table 1 were conducted on sediment, elutriate, and site water samples as described in the SAP. Bulk sediment and elutriate analyses were undertaken on the composite samples and site water using the method described in the SAP.

The elutriate samples were prepared in accordance with Dredging Elutriate Test (DRET) methodology (DiGiano et al. 1995). In general, sediment and site water were mixed with a solids-to-water volume ratio of 1:250, aerated for 1 hour, the supernatant harvested and centrifuged or filtered, and the purified supernatant analyzed.

2.7 Field Observations

Sediments were observed to be similar in consistency across the site; upper portions of the cores generally consisted of gray, silty material. A summary of core log information is included in Table 2. Although cores achieved greater recovery than project depth, materials from below project depth were excluded from the test sample volumes. Unconsolidated sediments were not encountered, indicating that the native sediment horizon is likely below the project depth.

Original field logs are included in Appendix A and core photographs in Appendix B.

3.0 RESULTS

3.1 Physical Characteristics Results

Particle size analyses were performed on the composite sediment sample collected from offshore (Stations B155A and B155B, Figure 2). The sediment was predominantly medium sands and silts, being composed of 18.1 percent gravel, 40.2 percent sand, 38.9 percent silt, and 2.8 percent clay. Grain size data are presented in greater detail in Appendix C.

3.2 Bulk Sediment Chemistry Results

Bulk sediment chemical analyses were conducted on two composite samples. The sediments collected from offshore (Stations B155A and B155B, Figure 2) were composited and termed "COMP B155A, B155B" in laboratory reports. Sediment samples collected via upland access (Stations Tt B155-1-2 and Tt B155-2-2, Figure 2) were likewise composited at the laboratory and termed "COMP Tt B155-1-2, Tt B155-2-2." Original reporting documents are included in Appendix D.

Physical parameter results are presented in Table 3 and were found to be consistent with the exceptions that the upland-accessed samples were found to have higher solids content and lower sulfides content.

Table 1. Chemical Analyses for Sediment Samples

Analyte	Units	Analysis Method	Sediment Target Detection Limits [a,b]
Grain Size	Percent	ASTM 1967	0.1
Total solids	Percent	160.3	0.1
Total organic carbon	Percent	9060	0.01
Total ammonia	mg/kg	350.2M[c]	0.2
Total & soluble sulfides	mg/kg	376.2M[c]	0.1
Arsenic	mg/kg	6020[d]	0.1
Cadmium	mg/kg	6020[d]	0.1
Chromium	mg/kg	6020[d]	0.1
Copper	mg/kg	6020[d]	0.1
Lead	mg/kg	6020[d]	5.0
Mercury	mg/kg	7471A[d]	0.02
Nickel	mg/kg	6020[d]	0.1
Selenium	mg/kg	6020[d]	0.1
Silver	mg/kg	6020[d]	0.2
Zinc	mg/kg	6020[d]	2.0
TRPH	mg/kg	418.1M[d]	5.0
PAHs[e]	µg/kg	8270C[d]	20
Organochlorine Pesticides[f]	µg/kg	8081A[d]	0.5 – 30
PCBs[g]	µg/kg	8082[d]	20
Phenols	µg/kg	8270C[d]	20 – 100
Phthalates	µg/kg	8270C[d]	10
Organotins	µg/kg	Rice/Krone[h]	1.0

[a] Sediment minimum detection limits are on a dry-weight basis.
[b] Reporting limits provided by Calscience Environmental Laboratories, Inc.
[c] Standard Methods for the Examination of Water and Wastewater, 19th Edition (APHA, 1998).
[d] EPA 1986-1996. SW -846. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Edition.
[e] Includes naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene.
[f] Includes aldrin, α-BHC, β-BHC, γ-BHC (lindane), δ-BHC, chlordane, 2,4- & 4,4-DDD, 2,4- & 4,4-DDE, 2,4- & 4,4-DDT, dieldrin, endosulfan I and II, endosulfan sulfate, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, and toxaphene.
[g] Includes Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1262.
[h] Rice, C.D. et al. 1987 or Krone et al. 1989

PAH — polycyclic aromatic hydrocarbon
PCB — polychlorinated biphenyl
TRPH — total recoverable petroleum hydrocarbons
mg/kg — milligrams per kilogram (parts per million)
µg/kg — micrograms per kilogram (parts per billion)

Table 2. Summary of Field Log Data

Station	Core #	Position (Latitude, Longitude)	Target Penetration (ft)	Core Recovery (ft)	Comments
B155A	1	33° 45.537 118° 16.186	5	6[a]	Top 0.5 feet gray loose silt; next 4 feet black/gray compact silt; bottom 1.5 feet black, clayey silt with shell hash. Strong organic odor especially in middle of core and sheen in deck wash-down.
B155B	1	33° 45.524 118° 16.199	5	7[a]	Top 1.5 feet dark gray silts with shell hash and gravel, minimal sand; next 0.5 feet black silt with rock; next 3 feet dark gray/black silt with little shell hash; bottom 1 foot dark gray/black fine sand with shell hash. Organic odor; sheen observed on deck, in pot rinse water.
Tt-B155 1-2	1	See Figure 2	15	15[b]	Only material from +4.8 ft MLLW and approximately -5 ft MLLW was retained; see associated TetraTech report
Tt-B155 2-2	1	See Figure 2	15	15[b]	Only material from +4.8 ft MLLW and approximately -5 ft MLLW was retained; see associated TetraTech report

[a] Sediments deeper than 5 ft below the mudline were discarded.
[a] Sediments outside the dredge area (including those above the +4.8 ft MLLW elevation) were excluded from sample volumes.

Table 3. Sediment Physical Parameter Data Summary

Parameter	Marine Sediment Sample	Upland Sediment Sample
Laboratory Sample Identifiers	COMP B155A & B155B	COMP Tt-B155-1-2 & Tt-B155-2-2
Total Solids, percent	62.8	81.1
Total Organic Carbon, percent	4.0	5.5
Ammonia, mg/kg	27	3.1
Dissolved Sulfide, mg/kg	ND	ND
Total Sulfide, mg/kg	99	2.1

mg/kg – milligrams per kilogram;
ND – not detected

Metals results are summarized in Table 4. Useful measures of marine sediment quality include the Effects Range-Low (ERL) and Effects Range-Median (ERM) values developed by Long et al. (1995) by screening published literature for samples identified as toxic by original investigators. The ERL was calculated as the lowest tenth percentile concentration of the available sediment toxicity data and represents a concentration below which effects to sensitive species are not expected. The ERM was the median effects concentration, above which adverse effects may be expected. ERLs and ERMs do not represent sediment quality criteria, but are useful in providing a general basis for characterizing sediment quality. Offshore sediments exceeded Effects Range-Median (ERM) benchmark concentrations for mercury (Long et al. 1995). Offshore sediments also exceeded seven Effects Range-Low (ERL) benchmark concentrations: arsenic, chromium, copper, lead, mercury, nickel, and zinc. None of the observed concentrations exceeded the California Title 22 Criteria Levels.

Table 4. Bulk Sediment Metal Chemistry Data Summary

Metal	Title 22 Limit	ERL	ERM	Marine Sediment Sample	Upland Sediment Sample
Laboratory Sample Identifiers				**COMP B155A, B155B**	**COMP Tt-B155-1-2, Tt-B155-2-2**
Arsenic (mg/kg)	500	**8.2**	***70***	**23.6**	4.3
Cadmium (mg/kg)	100	**1.2**	***9.6***	1.15	ND
Chromium (mg/kg)	2500	**81.0**	***370***	**91.2**	13.9
Copper (mg/kg)	2500	**34.0**	***270***	**129**	14.7
Lead (mg/kg)	1000	**46.7**	***218***	**134**	3.47
Mercury (mg/kg)	20	**0.15**	***0.71***	***2.13***	**0.187**
Nickel (mg/kg)	2000	**20.9**	***51.6***	**28.2**	11.7
Selenium (mg/kg)	100	NA	NA	2.25	0.743
Silver (mg/kg)	500	**1.0**	***3.7***	0.421	ND
Zinc (mg/kg)	5000	**150**	***410***	**234**	41.3

Bold values indicate exceedance of an ERL value.
mg/kg – milligrams per kilogram
NA – not available/not applicable
ND – not detected above the method reporting limit
ERL – Effects Range-Low
ERM – Effects Range-Median
Title 22 Limits are in wet weight concentrations

Upland-accessed sediments exceeded only two ERL benchmark concentrations: arsenic and mercury.

Organics results (Table 5) indicate moderate sediment concentrations from the offshore area. Total recoverable hydrocarbons (TRPH), organotins, total DDTs, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs) were detected in offshore sediments. Total DDTs and total PCBs both exceeded ERM concentrations at 126 µg/kg and 123 µg/kg, respectively. Total PAHs were above the ERL concentration but below the ERM level at 8,820 µg/kg (Appendix D). None of the concentrations exceeded California Title 22 levels. Phthalates were the only organic contaminant detected in the upland-accessed sediments (56 µg/kg, Table 5).

Table 5. Bulk Sediment Organic Chemical Data Summary

Analyte	Title 22 Limit	ERL	ERM	Marine Sediment Sample	Upland Sediment Sample
Laboratory Sample Identifiers				**COMP B155A, B155B**	**COMP Tt-B155-1-2, Tt-B155-2-2**
TRPH (mg/kg)	NA	NA	NA	1900	ND
Organotins (µg/kg)	NA	NA	NA	75	ND
Total DDTs (µg/kg)[a]	1000	**1.58**	***46.1***	***126***	ND
Total PCBs (µg/kg)	50000	**22.7**	***180***	***230***	ND
Total PAHs (µg/kg)	NA	**4,022**	***44,792***	**8,820**	ND
Total Phthalates (µg/kg)	NA	NA	NA	ND	56
Total Phenols (µg/kg)	17000	NA	NA	ND	ND

[a] 4,4'-DDT was the only pesticides detected in the marine sediment sample.
Bold values indicate exceedance of an ERL value.
µg/kg – micrograms per kilogram
mg/kg – milligrams per kilogram
NA – not applicable/not established
ND – not detected above the method reporting limit
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
TRPH – total recoverable petroleum hydrocarbons
ERL – Effects Range-Low
ERM – Effects Range-Median
Title 22 Limits are in wet weight concentrations

3.3 Elutriate Chemistry Results

Elutriate and site water testing results indicate that the metals arsenic, cadmium, lead, mercury, and selenium, and the most organic analytes were not detected above their respective reporting limits. Chromium, copper, nickel, and zinc were detected in both offshore and upland sediment sample elutriates; silver was observed solely in the upland-accessed sample elutriate. None of the metals results was above California Toxics Rule (CTR) criteria. Method detection limits were below CTR criteria (EPA 2000). Results are included in Table 6; original elutriate chemistry reports are included in Appendix E (site water testing results are reported in Appendix D).

Table 6. Elutriate and Site Water Chemistry Results

Analyte	CTR Criteria	Site Water	Offshore Elutriate	Upland Elutriate
Arsenic (µg/L)	69	ND	ND	ND
Cadmium (µg/L)	42	ND	ND	ND
Chromium (µg/L)	1100	ND	1.24	1.94
Copper (µg/L)	4.8	1.08	1.87	3.09
Lead (µg/L)	120	ND	ND	ND
Mercury (µg/L)	NA	ND	ND	ND
Nickel (µg/L)	74	1.51	0.713	1.78
Selenium (µg/L)	290	ND	ND	ND
Silver (µg/L)	1.9	0.954	ND	0.187
Zinc (µg/L)	90	21.6	30.5	89.6
Organotins (µg/L)	NA	ND	ND	ND
Total DDTs (µg/L)	0.13[a]	ND	ND	ND
Total PCBs (µg/L)	NA	ND	ND	ND
Total PAHs (µg/L)	NA	ND	5.0	ND
Total Phthalates (µg/L)	NA	ND	ND	ND
Total Phenols (µg/L)	NA	ND	ND	ND

[a] CTR criterion is for 4,4'-DDT only.
µg/L – micrograms per liter
NA – not applicable/not established
ND – not detected above the method reporting limit
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl

3.4 Data Validity

Quality assurance/quality control (QA/QC) was maintained during the analytical portion of this study by using duplicate sample analyses, re-agent blanks, and spiked samples as specified in the USEPA methods for individual analytes. Quality assurance data is presented in full detail within the original chemistry reports (Appendices D and E). This section summarizes the results of the quality control procedures reviewed to validate the chemistry data.

3.4.1 Sediment Data Validity

Reporting limits achieved in this study either met the program targets or were within an order of magnitude higher than those listed in the project SAP (Table 7). Elevated detection limits were attributed to matrix interferences associated with characteristics of the sediments tested.

Quality control measures indicated that all samples were in control with the exception of several analyte matrix spikes. These included silver, zinc, Aroclor 1016, and several pesticides. For all matrix spike out-of-control results and respective RPD control limit exceedances (for EPA 8081/8082 analyses), respective laboratory control sample results were in control (indicating matrix interference) and the data deemed valid.

Recovery of the 8270C surrogate analyte p-Terphenyl-d14 was initially observed to be above the control limit, but was found to be within control limits following preparation and analysis of a five-fold dilution sample. In consideration of the results of the dilution and acceptable recoveries in the method blank, matrix interference was again indicated and the data deemed valid.

3.4.2 Elutriate Data Validity

All quality assurance data was within established control limits for aqueous samples with the exception of matrix spikes for mercury. However, laboratory control samples and relative percent difference parameters were within control limits and the data released without further qualification. Analysis reporting limits were compared to the California Toxics Rule (CTR) (EPA 2000) Criterion Maximum Concentrations (Table 8) and found to be sufficiently low to detect exceedances with the exceptions of chlordane, endosulfan compounds, endrin, heptachlor epoxide, and toxaphene. Although these reporting limits were well within one order of magnitude of the CTR criteria (with the slight exception of toxaphene), they do represent cases in which the actual elutriate concentrations may have exceeded CTR criteria but would not necessarily have been detected using the methodologies employed for this investigation. However, in consideration that these analytes were also not detected in bulk sediment analyses, the likelihood that CTR criteria would be exceeded is negligible.

Table 7. Target and Achieved Analytical Detection and Reporting Limits

Analyte	Sediment Target Detection Limits[a]	Achieved Sediment Reporting Limits[a]	Elutriate Target Detection Limits[b]	Achieved Elutriate Reporting Limits
Grain Size	0.1%		-	-
Total solids	0.1%	0.1%	-	-
TOC	0.01%	0.062 - 0.080%	-	-
Total ammonia	0.2 (mg/kg)	0.25 - 0.32 (mg/kg)	-	-
Total & Soluble Sulfides	0.1 (mg/kg)	0.12 - 3.2 (mg/kg)	-	-
Arsenic	0.1 (mg/kg)	0.100 - 0.159 (mg/kg)	10 (µg/L)	15.0 (µg/L)
Cadmium	0.1 (mg/kg)	0.100 - 0.159 (mg/kg)	2 (µg/L)	1.00 (µg/L)
Chromium	0.1 (mg/kg)	0.100 - 0.159 (mg/kg)	5 (µg/L)	3.00 (µg/L)
Copper	0.1 (mg/kg)	0.100 - 0.159 (mg/kg)	5 (µg/L)	2.00 (µg/L)
Lead	5.0 (mg/kg)	0.100 - 0.159 (mg/kg)	5 (µg/L)	3.00 (µg/L)
Mercury	0.02 (mg/kg)	0.0200 - 0.0318 (mg/kg)	0.2 (µg/L)	0.200 (µg/L)
Nickel	0.1 (mg/kg)	0.100 - 0.159 (mg/kg)	5 (µg/L)	2.00 (µg/L)
Selenium	0.1 (mg/kg)	0.500 - 0.794 (mg/kg)	10 (µg/L)	60.0 (µg/L)
Silver	0.2 (mg/kg)	0.100 - 0.159 (mg/kg)	2 (µg/L)	1.0 (µg/L)
Zinc	2.0 (mg/kg)	0.500 - 0.794 (mg/kg)	10 (µg/L)	40.0 (µg/L)
TRPH	5.0 (mg/kg)	10 - 200 (mg/kg)	-	-
PAHs[c]	20 (µg/kg)	5 - 160 (µg/kg)	5 (µg/L)	1.2 (µg/L)
Organochlorine Pesticides[d]	0.5 – 30 (µg/kg)	1.0 – 32 (µg/kg)	5 - 25 (µg/L)	0.10 – 2.4 (µg/L)
PCBs[e]	20 (µg/kg)	10 - 16 (µg/kg)	5 (µg/L)	1.0 - 1.2 (µg/L)
Phenols	20 – 100 (µg/kg)	79 - 4000 (µg/kg)	0.5 (µg/L)	1.2 - 24 (µg/L)
Phthalates	10 (µg/kg)	20 - 160 (µg/kg)	0.05 - 2 (µg/L)	1.0 - 1.2 (µg/L)
Organotins	1.0 (µg/kg)	3.7 - 4.8 (µg/kg)	1.0 (µg/L)	3.0 - 3.6 (µg/L)

[a] Sediment minimum detection limits are on a dry-weight basis.
[b] Reporting limits provided by Calscience Environmental Laboratories, Inc.
[c] Includes naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene.
[d] Includes aldrin, α-BHC, β-BHC, γ-BHC (lindane), δ-BHC, chlordane, 2,4 & 4,4-DDD, 2,4 & 4,4-DDE, 4,4-DDT, dieldrin, endosulfan I and II, endosulfan sulfate, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, and toxaphene.
[e] Includes Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1262.

µg/kg – micrograms per kilogram
µg/L – micrograms per liter
mg/kg – milligrams per kilogram
mg/L – milligrams per liter
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
TOC – total organic carbon
TRPH – total recoverable petroleum hydrocarbons

Table 8. Reporting Limits and CTR Criteria

Constituent	California Toxics Rule Criterion Maximum Concentration	Achieved Elutriate Reporting Limit
Arsenic	69	15
Cadmium	42	1.00
Chromium (VI)	1100	3.00
Copper	4.8	2.00
Lead	120	3.00
Nickel	74	2.00
Selenium	290	60.0
Silver	1.9	1.00
Zinc	90	40.0
Aldrin	1.3	0.10 - 0.12
γ – BHC	0.16	0.10 - 0.12
Chlordane	0.09	1.0 - 1.2
4,4' DDT	0.13	0.10 - 0.12
Dieldrin	0.71	0.10 - 0.12
Endosulfan I	0.034	0.10 - 0.12
Endosulfan II	0.034	0.10 - 0.12
Endosulfan sulfate	0.037	0.10 - 0.12
Endrin	0.053	0.10 - 0.12
Heptachlor[a]	0.053	0.10 - 0.12
Toxaphene	0.21	2.0 - 2.4

[a] As Heptachlor epoxide.
All units in µg/L – micrograms per liter.
Includes only analytes for which there is an established criterion.

4.0 DISCUSSION

Two sediments were sampled as part of this investigation: those from within the dredge footprint from an upland access point and sediments outside the dredge footprint in the vicinity of the U.S. Pierhead line. Sediments collected within the footprint are substantially less contaminated than those offshore. However, in both cases contaminants are well below hazardous waste criteria and in all cases less than the ERM (with the exception of mercury in the offshore sediments).

In addition, DRET results did not exceed any CTR criteria. Some individual pesticide reporting limits were greater than their respective CTR criteria, and determination of criteria exceedance was therefore not possible. However, pesticides were not observed in bulk sediments, and should not be considered a high risk with respect to environmental effects during dredging.

Sediments proposed for dredging are appropriate for upland disposal at the Anchorage Road Sediment Storage Site.

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